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ABSTRACT

The Milwaukee Project is an attempt to provide science teachers at all grade levels with the background and support they need to involve handicapped students in a regular science class. Goals of the project include the improvement of preservice and inservice teacher training to prepare teachers to include the handicapped child in the mainstream and the preparation, modification, and dissemination of material resources which will help insure success for the individuals involved. To aid in the attainment of these goals, demonstration and inservice centers have been established at the elementary, middle, and high school levels where classroom teachers learn through observation and direct involvement to work with mainstreamed, handicapped students in regular classroom settings. The centers are regular classrooms following the regular curriculum. No special or unique equipment has been placed in these classrooms so that visiting teachers will see that, in most cases, materials need only be modified to achieve success. Teachers attending these centers work with handicapped students, performing the laboratory activity scheduled for that day. Operation of the centers, modification of class materials, and teacher reaction are discussed. (Author/JN)

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THE MILWAUKEE PROJECT: SCIENCE FOR THE HANDICAPPED IN THE MAINSTREAM DEMONSTRATION AND INSERVICE CENTER

The passage of laws which seemed to indicate to teachers, especially science teachers, that handicapped youngsters would be moving out of their special rooms into the mainstream produced all kinds of fears. How would we identify science rooms so blind students would not walk in and burn themselves with acids? Certainly we couldn't have a deaf student in chemistry -- how could the student hear instructions, the sound of liquids boiling in test tubes, or the lethal hiss of an open gas jet. There was no way the shaky, palsied student could be permitted to handle a scalpel! Science was the one subject off limits to mainstreaming. Warning signs and bells would have to be strategically placed and door knobs marked by a file to warn the blind student that behind this door is science! Off limits! Danger!

What a difference a few years make! Today, teachers of science ask how can we mainstream successfully and safely. Where can we obtain information and directions when we work with handicapped students? Teachers are taking the initiative.

The Milwaukee Project is an attempt to provide teachers of science at all grade levels with the background and support they need to involve the handicapped student in a regular science class. This project, funded under Title IV-C of the Elementary and Secondary Education Act, is titled Science for the Handicapped Demonstration and Teacher Training Centers.

The goal of this project includes the improvement of preservice and inservice teacher training to prepare teachers to include the handicapped child in the mainstream and the preparation, modification, and dissemination of materials resources which will help insure success for the individuals involved.

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To aid in the attainment of these goals, demonstration and inservice centers have been established at the elementary, middle, and high school levels where classroom teachers learn through observation and direct involvement to work with mainstreamed handicapped students in regular classroom settings.

THE CENTERS

The centers are presently in operation staffed by teachers who teach half-time and work on teacher inservice or activity modifications the balance of the school day.

The centers themselves are regular classrooms containing the usual assortment of bulletin boards, tables, desks, and aquariums. No special or unique equipment has been placed in the classrooms; it is our goal to demonstrate to visiting teachers that, in most cases, a teacher can modify materials to obtain success. Exotic equipment is not a prerequisite for successful mainstreaming.

The students in the high school level center classes either are taking Physical Science or Biology. These classes, of about thirty students each, include mainstreamed learning disabled, emotionally disturbed, and students in wheelchairs. Handicapped students make up about 20 percent of each class. The students at the middle school center are studying Earth and Life Science. At the middle school center, handicapped students, including the learning disabled, emotionally disturbed, and wheelchair students again make up about 20 percent of the class. An exploratory period replaces one class. During exploratory, visiting inservice teachers may observe student volunteers attempting to develop modifications to the laboratory activities for their handicapped classmates. They have been successful -- students using straws, drills, glue, and string have developed useful earth science modifications. The students in exploratory enjoy the challenge; their creativity flowers.

Second, fourth, and sixth grade students are brought to the elementary science center by their classroom teacher to study science three times per week. This center is in an unused kindergarten room which has been modified as a science center. Visiting elementary teachers, who are attending the inservice, see that the tables and chairs used by the small children have been replaced by regular tables and desks in a variety of sizes. The reason for the variety in furniture is again to demonstrate to teachers, as they observe at the center, that the furniture found in a regular classroom functions very well in science laboratory settings. The make up of the class at the elementary level is similar to that found at the other centers. However, because the center is located at an elementary school with a school for the physically handicapped attached, more students with this type of handicap are included in the science center classes.

Each center is in reality a regular classroom taught by a regular education teacher following the normal curriculum. The difference is in the fact that there may be children displaying a wider range of handicaps found in these classes than is normally expected.

Teachers attending the inservice at a center work with the handicapped students performing the laboratory activity scheduled for that day. Teachers report for this section of the inservice on days when a hands-on activity is planned; this permits the teacher to gain confidence and experience working with handicapped students. The person-to-person experience will produce a positive change in attitude for the teachers, affecting their willingness to include handicapped students in science activities.

The Beginning

In 1979, a group of educators from the State of Wisconsin met at a wilderness resort to talk about Public Law 94-142 and its implications for science education. Out of this conference came the idea for the establishment of science centers where teachers might be trained to work with handicapped students. After

searching through various publications and doing an ERIC search, two things became obvious: (1) very little was being done in this area, and (2) the work being done was centered, for the most part, at the Lawrence Hall of Science - University of Southern California, Berkeley, under Dr. Herbert Thier, and at the American University under Dr. Doris Hadary. Neither program covered the entire spectrum of handicaps nor the three levels of public education.

Project writing began aiming at a three-year innovative/exploratory grant under Title IV-C - E.S.E.A. Along with this, Dr. Hadary was contacted and asked to make a presentation to the project group to provide background on her project.

After many hours of writing, discussing, and re-writing, the project titled Science for the Handicapped Teacher Training and Demonstration Centers was submitted and funded from September, 1980, through June, 1983.

Three school sites were identified, and three teachers and a project director selected before school opened in September, 1980. The sites were selected partially based on where the center teachers taught and partially on whether handicapped students were present in that building. The selection of teachers was simplified by the fact that two teachers who had been involved since the 1979 meeting volunteered to be center teachers, and their schools fit the stated requirements.

The Center Teachers

The nature and scope of this project made it essential that teachers selected to operate the centers be experienced, successful regular classroom teachers who exhibited more than the normal amount of creativity, interest in their students, and ability to adjust to unusual circumstances. The three team members and the director of the project are identified in Figure 1. The three teachers, Robert Meerschaert, Robert Engstrom, and Rhulene Swanigan, had no formal exceptional education background.

We have been fortunate in finding three people who fit the project's requirements. Rhulene Swanigan, Bob Meerschaert, and Bob Engstrom have worked together with little friction or ego involvement. As a result, we have established a strong team spirit which has helped make our project successful.

Beginning with almost no science background, the elementary teacher Rhulene Swanigan, now digs through all the old hands-on kits looking for things she can use for her laboratory activities where none existed, talking to the exceptional education teachers about the handicapped students and to her team members about alternate laboratory activities and technical information about science concepts.

Bob Meerschaert, the high school center teacher, is a strong, no-nonsense teacher, well educated in science, organized, and experienced in working with students from seventh to twelfth grade. Bob's special forte is the ability to physically modify laboratory materials to enable handicapped students to perform regular laboratory activities. A modification to laboratory activities in the area of light allows a blind student to measure the angle of incidence and reflection and identify a spectrum. A modification to the inclined plane, a series and parallel circuit boards, a device for allowing a student in chemistry to perform titration and precipitate experiments are all modifications which have sprung from this inventive and innovative teacher. (See figure 2.)

One of Bob's prize innovations is a technique for making graphs for a blind student at a neighboring high school. This student had been falling behind in his physics experiment write-ups because it took a great deal of time to construct a usable graph; Bob devised a method by which the student can construct an acceptable graph for his work in about four minutes.

The middle school student is a challenge to any teacher. Their social Awareness, energy, and change in moods requires a teacher who is calm, strong, determined, and gentle; Bob Engstrom has these qualities. He has a strong commitment to his students and the project. As a result, he is very serious about the performance of the activities and our attaining our objectives.

Bob brings a studious research approach to the middle school laboratory modifications. Dealing with Life and Earth Science topics provides an unusual challenge: how does a blind student measure out 30 milliliters of water or construct the lines of latitude and longitude on a hemisphere? Bob has the unique opportunity to work on these challenges because there are blind students attending his school; next year, he will have a number of visually impaired students in his class.

The blending of the ability to innovate, the research approach, and interest in children brought to our team by the three center teachers has enabled us to develop procedures for adapting the various science curricula which are flexible and practical without forgetting that we are working with people. It has also enabled us to change the attitudes of teachers we work with in the inservice about their ability to effectively teach science to mainstreamed students.

Because none of the team members had any background in exceptional education, arrangements were made for the TEAM to visit classrooms, attended by students with various handicaps, to talk to the students and teacher in order to become familiar with this area of education.

Arrangements were made with supervisors for the areas of deaf and blind education, learning disabled, emotionally disturbed - mentally retarded, and physically handicapped students for inservice sessions in their specialty.

Dr. Hadary, at the American University, offered the Milwaukee Project teachers an inservice for a three-week period at the American University where she has a model program for first through sixth graders in mainstreaming in science and art. Indepth visits were also made to state institutions for the deaf, blind, etc.

All of these activities during the first year provided us with knowledge about the needs of handicapped students, acquainted us with teachers and supervisors in exceptional education, and gave us confidence that our centers were possible and practical.

We rapidly became aware of the crucial need for the regular teacher (with expertise in subject areas) and the exceptional education teacher (with expertise in working with and around the various handicaps) to join together to form a mutually supportive partnership, if our mainstreamed handicapped students were to succeed.

While learning about the exceptional child, we also began our modification activities. We modified the simple first -- a stick taped to a knifeswitch for a paralyzed child, a brailled label for a blind child, a sketch of the solar system using white chalk on black tagboard for a learning disabled student.

We observed, talked, read, and watched films and filmstrips, and continue to do so in order to increase our understanding of the handicapped and keep up with change and innovation in the area of aids for the handicapped.

The Machines -- The Test

Talking calculators, flexible grabbers, voice activated switches -- the list of materials becoming available to the handicapped goes on and on. We believe that the handicapped youngster can function in a laboratory setting with the proper modifications to the regular laboratory activities. We have found it necessary

to modify a variety of laboratory equipment and procedures and to introduce materials not normally used in science activities. Many supply houses carry commercially prepared materials for the handicapped which are usable in the laboratory.

We began with modifications to the areas of elementary science, earth science, and physical science for blind students. Instead of finding ways to keep the visually impaired student out, we used a labeler that changes English to braille, large alligator clips, liquid level indicators, nail polish, and light sensors to modify the materials used in the laboratory.

The light sensor changes light to sound. Different colors produced different pitches which a blind student quickly learns to recognize as signifying changes in color. With it, the student can identify a change in color of an indicator or know when a light goes on indicating he has correctly wired a circuit.

The use of nail polish and Elmer's Glue to provide a raised line drawing or mark is all the modification that may be needed in some cases. (See Figure 3.)

The microchip has led to a whole new group of machines for use by handicapped students. Calculators talk and print in braille at the same time. There are talking thermometers that give the temperature in Celsius or Fahrenheit and a talking multi-meter for work with volts, amperes, and resistance. Computers and typewriters can respond to the spoken command of a paralyzed child. Software is being produced at an increasing rate which will allow a physically handicapped youngster to work around his or her crippled body to free their intellect and permit them to learn and communicate.

The talking machines are exciting and the equipment modifications we make may appear to be ready to be used by the students; however, these materials need testing in a controlled setting. We took the modified chemistry and physics activities to a high school where a blind student tested our modifications. We took the earth science and elementary science activities to self-contained classes where blind students tested the modifications. Earth science and elementary science activities were taken to self-contained classes where blind students could work with modifications to activities dealing with topography, planets, and animal identification. Many modifications worked as we visualized they would -- some needed revisions, other laboratory activities required no modification at all. The blind students worked with series and parallel circuits more rapidly and efficiently than some sighted fellow students. We found that blindness was not a significant barrier to science involvement, and special safety concerns were minimal.

The various devices for the orthopedically handicapped student also proved to be less of a challenge than origanally thought. There are a number of companies producing mechanical gadgets designed for the person who has muscular dystrophy, spinal bifida, paralysis, or other physical handicaps. These materials are usable or easily modified for use in science activities. For example, we have purchased a special "grabber" with soft rubber ends which enables a student in a wheelchair to collect fallen leaves easily. The use of DYCEM, a plastic material, holds materials in place for use by the palsied child. Figures 4 and 5 show these modifications. The teachers coming to the centers for inservice work with the students and observe the social interaction as the handicapped student becomes part of the class. As we worked with teachers, we began to hear one message over and over

again -- it is not the blind student, not the student with cerebral palsy, spinal bifida, or other physical disability who is the greatest challenge to mainstreaming in science. The challenge we face is the challenge of the student with a learning disability.

THE REAL CHALLENGE

The blind child, the deaf child, or the child with a physical disability stands out -- the disability easily identifiable and often easily circumvented, the intelligence is normal. The child with a learning disability wears no sign, shows no identifiable tick, his or her eyes are clear, voice pure, hearing excellent. For the learning disabled child not only is the handicap hidden, often also hidden is the method for mitigating the handicap.

As we have developed awareness of the student with a handicap, the challenge of the learning disabled has made itself paramount. Our real challenge has been identified.

All teachers have had learning disabled students in their classes without being aware of this fact. They are the students who have normal intelligence but somehow the information processing areas of their brains do not function. They may not be able to read but speak well; they may have penmanship that would make a penmanship teacher leave the business; they may be quiet or loud, poorly organized, or find themselves unable to stop an activity once they have started it; they forget; they lose things; they get into trouble.

A talking machine of some kind cannot solve the learning disabled student's learning problems, nor will a light sensor or nail polish mark mitigate the disfunction. The modification necessary for successfully mainstreaming the learning disabled student is constructed of factors which are all human. These factors are: knowledge and cooperation. This is the central theme teachers, who attend inservice, receive at our centers.

The regular teacher needs to know what the child's disfunctions are and the methods useful in working around the disfunction. This knowledge is available only through the student's exceptional education teacher and from the great array of reports and investigations done by teachers, counsellors, and psychologists before the child was identified as having an exceptional education need (E.E.N.).

The cooperation factor is essential. As a teacher of science, I am not aware of the fact that when a report about a learning disabled student states that the child has "poor visual motor integration" that what is meant is that the child cannot copy from the board or textbook and, more important, I have no training to work around the disability. It is essential for a dialogue to be developed involving the subject expertise of the regular teacher and the special knowledge concerning the child's handicap known only to the exceptional education teacher. It is the special education teacher who has the knowledge to mitigate the handicap.

Our experience has been that a science teacher, working without help from an exceptional education teacher has little chance of providing the modifications necessary for the learning disabled and emotionally disturbed student's success. The disabilities may be different, but the children all look the same. While Ann may need to have her tests given orally, Bill might require fewer choices in answering questions, while Oliver may function better if he can be seated in the back of the room near a wall.

Unfortunately, human relations modifications are the most difficult modifications to make.

The Key Modification

In a survey of teachers of science made last year, the following question was asked. If you were given the opportunity to take an inservice course at a school where handicapped youngsters are mainstreamed, would you take it? Fifty percent of the teachers responded yes, but the other fifty percent said no.

Their reasons for saying no were basically two: "If I take this course, the exceptional education teachers will 'dump' their kids on me, and they will have a free period," or "the exceptional education department has people specially trained to work with the kids; keep them there."

On a trip to Los Angeles, while visiting a satellite model center established by the American University Program, I was told they had received the same feedback from teachers.

Exceptional education teachers have expressed frustration in attempting to work with regular classroom teachers. The frustration seems the greatest at the high school level and lowest at the elementary level.

"They don't care about my students," "They ignore them," "They refuse to allow a little extra time," etc., are all comments made by exceptional education teachers. Along with this is the fear of some exceptional education teachers that our project and mainstreaming in general is an attempt to eliminate exceptional education classes. Again, the feeling is usually expressed at the high school level.

The key modification is that modification which will bring about a partnership at the grassroots level between the exceptional education teachers and the classroom teachers which mitigates the fears they both express.

We have begun actualization of this key modification in a number of ways. We have explained our project and its goals to administrators and supervisors in the Division of Exceptional Education and Supportive Services to keep them informed of our progress and to request their assistance in our inservice program. We have asked to be placed on the exceptional education departmental mailing list so that we receive notices of inservice meetings, changes in procedures, etc., and we have had articles published offering assistance to teachers in the field in the exceptional education departmental newsletter.

Teachers in exceptional education are included as part of our teacher pool eligible to take our inservice course where they learn about our goals and modifications while they add to our knowledge and the knowledge of teachers being given inservice in areas of techniques, procedures, and dialogue.

Progress is apparent. At present, there are, in some Milwaukee schools, team-teaching situations in science involving both the science teacher and the exceptional education teacher who works with the learning disabled. Of course, more needs to be done, but progress is being made through the inservice program. A handbook has been developed to help teachers ask the question of the proper individual in their buildings.

The Inservice Connection

Providing inservice training is the major component of this project. At the present time there are combined inservice sessions for elementary, secondary, and exceptional education teachers. These teachers are released from their normal teaching schedules to receive information about mainstreaming work at the centers in the regular classroom with handicapped students, discuss their experiences and problems, and meet and talk to handicapped students and adults who have been successful in school, business, industry, and education. To provide a relaxed, person-to-person dialogue, teachers taking the inservice wear name tags only. School, subject, etc., is omitted to avoid the bias titles might present.

As part of the inservice, teachers are given a handbook titled The Handicapped Student in Science. The teachers are taken through the handbook as a group, discussing some of the areas which might be the most immediately useful. Topics in the handbook include: "General Responsibilities," dealing with placements, evaluation, and special treatment of handicapped students, and a form titled "Mainstream Student Information" which provided the classroom teacher with a profile of the student socially and academically. (See Figure 6.) The section

titled "Hobbies" on the information form may serve as a starting point for development of a dialogue between the teacher and the student. The teacher has information about the child which can serve as an opening dialogue, making both feel more at ease.

Comments from teachers have been positive concerning their inservice experiences. "This is the first time I have ever sat down and talked 'children' to an exceptional education teacher," "I was surprised how well a blind student can move around a room," "This is the first time I have met someone who is blind and a college graduate," "I feel this inservice has given me the additional insight I need to understand and cope with the learning disabled child," etc. Comments, such as these, indicate that inservice courses providing face-to-face disucssion between educators are the key to changing attitudes involving mainstreaming.

It is our hope that these new attitudes and perspectives will be carried into the schools, and the teachers who have had inservice will begin to build the bridges of communication between themselves, their fellow teachers, and the mainstreamed handicapped students which are necessary for mainstreaming to succeed.

Conclusion

As we think back to Public Law 94-142, and our fears, we realize that the filing of door handles, warning signs, etc., were never necessary. Handicapped students come in all sizes, shapes, and reading levels, just like their fellow classmates. As a sign of the times, recently, at a Milwaukee high school, a student was given a detention for "driving his wheelchair through the halls in a reckless manner."

It is true that some students, because of the severity of their handicaps, will achieve more in a special setting rather than in the mainstream, but for a very large number of handicapped youngsters, working in the real world is possible.

It is not the handicapped student alone who is challenged. We, too, are challenged as educators. It is up to us, the regular and exceptional education educators, to find a way around the handicap by uniting the special training of the exceptional education teacher with the subject expertise of the regular teacher.

As the Milwaukee Project moves into its third year, our challenge remains the same: first, the improvement of pre-service and inservice teacher training to prepare teachers to include handicapped students in the mainstream, and, second, the identification, preparation, and dissemination of inventories of human and material resources, which provide the foundation for successful mainstreaming.

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